A compendium of shipbuilding standards.
Interim report on subtask II: industrial standards in shipbuilding use.

Corporate-Tech Planning, Inc.

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THE NATIONAL SHIPBUILDING RESEARCH PROGRAM

TASK S-20

A COMPENDIUM OF SHIPBUILDING STANDARDS

U.S. DEPARTMENT OF COMMERCE

MARITIME ADMINISTRATION

in cooperation with

BATH IRON WORKS CORPORATION
700 Washington Street
Bath, Maine 04530

INTERIM REPORT

ON

SUBTASK II

INDUSTRIAL STANDARDS IN SHIPBUILDING USE

prepared by:

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MAY 1979

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EXECUTIVE SUMMARY

1. The purpose of Subtask 11 is to identify industrial standards which are in use by the shipbuilding community and to catalogue them by originating organization, by Ship Work Breakdown Structure (SWBS) number, by subject, and by the subcommittee of the ASTM Committee F-25 for Shipbuilding. Computer print-outs of these four listings are incorporated in Appendix B.

2. The standards included in Subtask 11 are all referred to in a marine regulation or classification rule or in a standard which *was* cited by a marine regulation or classification rule. They are not intended for exclusive maritime use.

3. The standards in this subtask are largely material standards for general industrial use. They are predominantly specifications, definitions, or tests.

1.1 PURPOSE

The purpose of Subtask II is to make available a compendium of industrial standards which are used extensively in some aspect of shipbuilding. This compendium contains a listing of the standards by:

- Originating organization
- Navy Ship Work Breakdown Structure (SWBS)
- Subject
- F-25 subcommittee assignment

In addition, the date of the standard and its system of units are recorded. If the same standard was issued by more than one organization (for example, many ASTM* standards are also issued with an ANSI Number) both synonyms were recorded if they were known. A special search to find all such synonyms was not part of the scope

*The acronym for most standards organizations are in common use and are used extensively in this report. A list of the full names is in Appendix A.

of this task. More and more organizations are arranging for ANSI to list their standards as national consensus standards.

1.2 SCOPE

In order to meet the specifications of the shipbuilding standards cataloged in Subtask I, it is necessary to adhere to certain industrial. standards which the shipbuilding standards cite. It is these cited industrial standards which have been screened for Subtask II. This relationship builds a third tier of standards atop the parent foundation standards found in the shipbuilding contract and the secondary level from regulatory or classification sources.

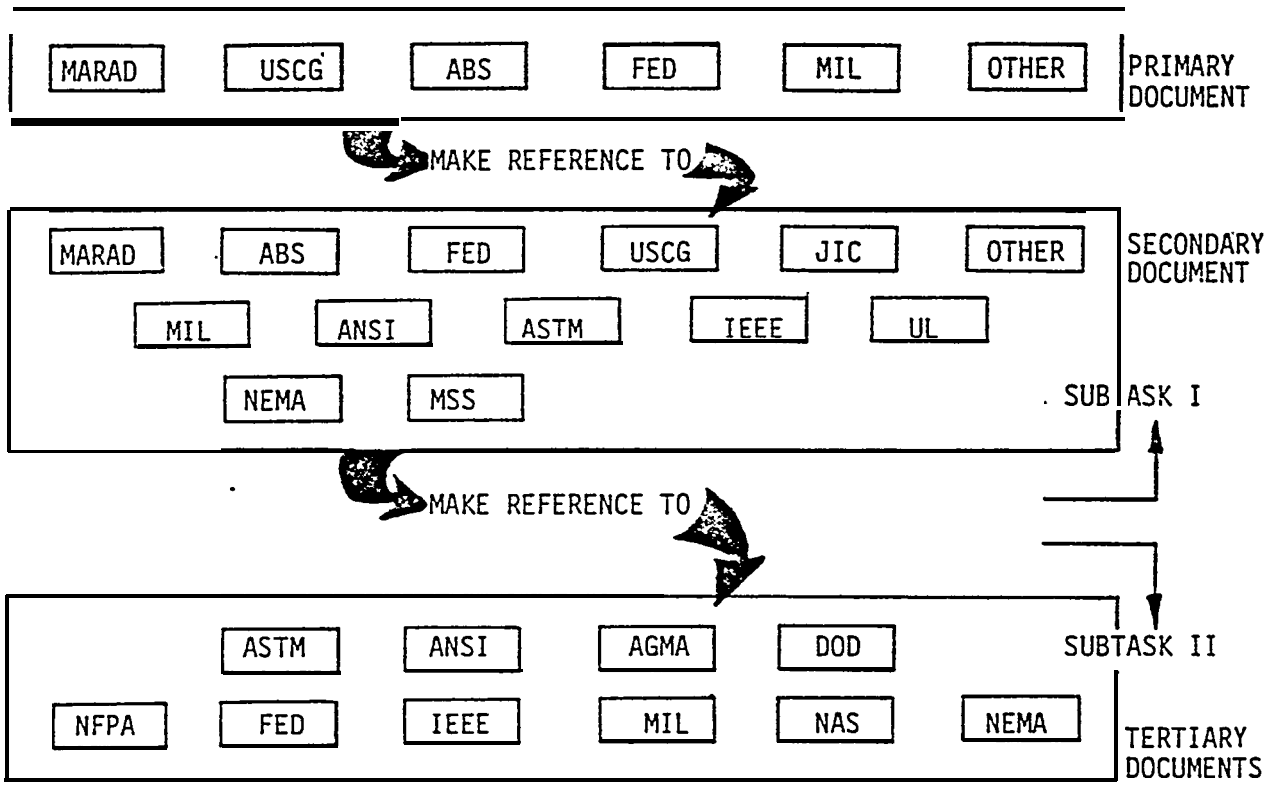

FIGURE 1: SUBTASK I EXAMINES THE FIRST AND SECOND LEVEL OF STANDARDS WHILE SUBTASK II EXAMINES THE THIRD LEVEL OF STANDARDS.

Sometimes the same standard occurs in more than one level. This is especially true in the secondary and tertiary documents. Consequently, the dividing line between Subtask I and Subtask 11 is irregular. In general, however, tertiary standards tend to be more generic in nature, dealing mostly with raw materials which the shipbuilder buys on the open market. Standards for the chemical composition of steel or aluminum, or standards covering screw thread profiles fall into this category.

The ten organizations listed in Table 1 contributed the 395 standards that are included in Subtask II.

ORIGINATING ORGANIZATION	NUMBER OF STANDARDS	PERCENT
AGMA	2	0.5
ANSI	17	4.3
ASTM	274	69.4
DOD	2	0.5
FED	18	4.0
IEEE	5	1.3
MIL	57	14.4
NAS	1	0.3
NEMA	2	0.5
NFPA	17	4.3
	395	100.0%

TABLE 1: DISTRIBUTION OF STANDARDS IN SUBTASK II BY ORIGINATING ORGANIZATION

Only ten of the standards are specifically for maritime use. The rest have applicability to other industries. Thus Subtask II is a compendium of industrial standards used by the maritime community.

1.3 METHOD

Since the method of examination of the standards was the same in Subtasks I, II, and III, a discussion of method is not repeated here. See pages 2 through 5 of the Subtask III, Foreign Shipbuilding Standards, which is available from John C. Mason, MarAd Program Director, 700 Washington Street, Bath Iron Works Corporation, Bath, Maine 04530, phone (207) 443-3311.

1.4 ACRONYMS

Organizations which issue standards have been identified by a code of two to five letters in the text of this report and in the computer print-out. Appendix A contains the list of full names of the organizations.

2.1 ANALYSIS OF FINDINGS

2.1.1 Originating Standards Organizations

As shown in Table 2 on the following page, ten organizations contributed standards to this subtask. ASTM was by far the largest contributor with almost five times as many entries as the second place group, MIL Specs.

The majority of the ASTM standards applied to materials, either composition or testing. The MIL Specs also dealt with materials and testing as well as packaging, labeling, welding, and documentation.

2.1.2 Ship Work Breakdown Structure (SWBS)

The standards are cataloged into the SWBS codes. Table 2 summarizes the distribution of SWBS groups and originating organizations. The SWBS groups are named below (SOURCE: NAVSEA 0900-LP-039-9010).

000-099	GENERAL GUIDANCE AND ADMINISTRATION
100-199	HULL STRUCTURE
200-299	PROPULSION PLANT
300-399	ELECTRIC PLANT
400-499	COMMAND AND SURVEILLANCE
500-599	AUXILIARY SYSTEMS
600-699	OUTFIT AND FURNISHINGS
700-799	ARMAMENT
800-899	INTEGRATION/ENGINEERING
900-999	SHIP ASSEMBLY AND SUPPORT SERVICES

These 395 standards have been given a tentative assignment to F-25 subcommittee. This is discussed in Section 2.3.

ORIGINATING ORGANIZATION	SWBS GROUP									TOTAL
	000 - 099	100 - 199	200 - 299	300 - 399	400 - 499	500 - 599	600 - 699	700 - 799	800 - 899	
AGMA			2							2
ANSI	5			5			4		3	17
ASTM	85			1		1	3		184	274
DOD	2									2
FED	2		4	2			7		3	18
IEEE				5						5
MIL	30	2	4	1	2	7	8	2	1	57
NAS						1				1
NEMA	1			1						2
NFPA	6			3	1	6	1			17
TOTAL	131	2	10	18	3	15	23	2	191	395
PERCENT (%)	33.2	0.5	2.5	4.6	0.8	3.8	5.8	0.5	48.4	100%

TABLE 2: DISTRIBUTION OF STANDARDS BY SWBS GROUP AND BY ORIGINATING ORGANIZATION.

2.1.3 Type of Standard

The classification of the standards by type is shown in Table 3. The classification is based on the most likely use of the standard by the shipbuilders. The standards are predominantly classified as testing (48.4%) or specification (42-8%) standards. This is why these standards are used by many industries and are not the sole province of shipbuilders.

	TYPE OF STANDARD BY USE					
ORIGINATING ORGANIZATION	DEF. & CLASS. CODE 1	DESIGN CODE 2	PROD. & OPER. CODE 3	TEST CODE 4	SPEC. CODE 5	TOTAL
AGMA		1			1	2
ANSI	2			3	12	17
ASTM	9	1	12	176	76	274
DOD		1			1	2
FED				3	15	18
IEEE	1		1	2	1	5
MIL	4	1	1	7	44	57
NAS					1	1
NEMA					2	2
NFPA	1				16	17
TOTAL	17	4	14	191	169	395
PERCENT	4.3	1.0	3.5	48.4	42.8	100%

TABLE 3: DISTRIBUTION OF STANDARDS WHEN TYPED BY END USE

2.1.4 Units of Measure

The system of units used on the Subtask 11 was predominantly in the U.S. Customary units (58.5%); dual dimensioning was used in 26.2% of the standards. More and more standards are being soft converted to dual units at the time of reaffirmation. ASTM is a leader in this movement.

Table 4 shows the distribution of units of measure in the standards examined.

	SYSTEM OF UNITS USED IN STANDARD						
ORIGINATING ORGANIZATION	METRIC SI CODE M	U. S. CUSTOMARY CODE E	BOTH U.S. CUSTOMARY & METRIC CODE D	OTHER SYSTEM CODE O	UNITS NOT APPLICABLE CODE N	UNKNOWN CODE U	TOTAL
AGMA		2					2
ANSI		15			i	1	17
ASTM	1	136	94	2	29	12	274
DOD					2		2
FED	1	11	5		1		18
IEEE		5					5
MIL		43	6		8		57
NAS	1						1
NEMA		2					2
N F P A		17					17
TOTAL	I 3	231	105	2	41	13	395
PERCENT	0.8	58.5	26.6	0.5	10.4	3.2	1002

TABLE 4: DISTRIBUTION OF UNITS OF MEASURE IN STANDARDS SHOWN BY ORIGINATING ORGANIZATION.

2.1.5 Potential Value to the U.S. Shipbuilding Industry

The initial criterion for rating standards according to their potential benefit to the U.S. shipbuilding industry was developed for use with foreign standards in Subtask III. The same criterion was applied to Subtask 1, Regulatory and Classification Standards. The criterion essentially asked whether the shipbuilder would find value from using the standard. Now in Subtask II we are at the tertiary level of standards, and the shipbuilder is only remotely connected to the standards involved. The suppliers use these tertiary level standards, but the shipyards frequently do not. They are beneficiaries, not users. As a consequence of this distinction in the criterion established for ranking direct potential benefit many Subtask II standards are given scores below "Great Benefit", even though the shipyard does need to deal with vendors who use these standards. See Table 5.

	POTENTIAL BENEFIT TO SHIPBUILDERS				
ORIGINATING ORGANIZATION	NONE 0	MARGINAL 1	MODERATE 2	GREAT 3	TOTAL
AGMA			2		2
ANSI	11	4	2		17
ASTM	78	95	98	3	274
DOD			1	1	2
FED	3	8	7		18
IEEE	1	2	2		5
MIL	2	4	50	1	57
NAS			1		1
NEMA		2			2
NFPA		3	13	1	17
TOTAL	95	118	176	6	395
PERCENT	24.1	29.9	44.6	1.5	1.00%

TABLE 5: DISTRIBUTION OF POTENTIAL BENEFITS BY ORIGINATING ORGANIZATION.

2.1.6 Changes Required for Use of Standards in U.S. Shipbuilding

It was recommended that only two standards be modified slightly in order to make them useful to the shipbuilding industry. These two NFPA standards applied to the installation of air conditioning and heating systems. The 05 Subcommittee could resolve this problem. See Table 6 which summarizes the findings.

MODIFICATION CODE MEANING	ORIGINATING ORG ANIZATION									
	AGMA	ANSI	ASTM	DOD	FED	IEEE	MIL	NAS	NEMA	NFPA
1 - MAJOR									-	
2 - MINOR									-	2
3 - NONE	2	17	274	2	18	5	57	1	2	15
TOTAL	2	17	274	2	18	5	57	1	2	17
									TOTAL	395

TABLE 6: MODIFICATIONS REQUIRED BEFORE STANDARD MAY BE USED BY U. S. SHIPBUILDERS

2.2 ANALYSIS BY SWBS GROUP

Standards in this subtask are not very evenly distributed among SWBS groups. Group 900-999, Ship Assembly and Support Services, has none; while 800-899, Integration/Engineering has 191 standards (48. 4%). Table 7 on the next page shows the distribution of standards by SWBS group.

The distribution is heavily weighted into the groups covering material specifications and generic standards. Only four percent of the standards examined specified that they are for shipboard use. The remainder of the standards have general industrial application.

SUBS GROUP		NUMBER OF STANDARDS	PERCENT
000-099	General Guidance and Administration	131	33.2
100-199	Hull Structure	2	0.5
200-299	Propulsion Plant	10	2.5
300-399	Electric Plant	18	4.6
400-499	Command and Surveillance	3	0.8
500-599	Auxiliary Systems	15	3.8
600-699	Outfit and Furnishings	23	5.8
700-799	Armament	2	0.5
800-899	Integration/Engineering	191	48.5
900-999	Ship Assembly and Support Services	0	0
F	Other	0	0
	TOTAL	395	100.0%

TABLE 7: DISTRIBUTION OF STANDARDS AMONG SWBS GROUPS.

The General Guidance and Administration Group (000-099) includes 131 standards divided among 16 subgroups.* Materials 078 contains 56.2% of the entries. These standards are predominantly ASTM developed and cover the specification for ferrous and non-ferrous metals and metal products and for some non-metals, such as plastics and rubber. These are all general industrial standards, and their use is not limited to shipbuilding.

Casting, Welding, Riveting and Allied Processes (General) 074, is the second largest subgroup with 16.2% of the entries. Thirteen of the 21 standards deal with castings, four apply to some aspect of welding on castings or fabricated parts. Three cover forgings. One is for riveting and one for non-destructive testing of castings.

* The word "subgroup" in intended to represent all work breakdown within an SWBS group.

The remaining standards are scattered among the other 14 subgroups as shown in Table 8.

SWBS SUBGROUP	NUMBER OF STANDARDS	PERCENT
042 GENERAL ADMINISTRATIVE REQUIREMENTS	8	6.2
060 SUBSYSTEM CHARACTERISTICS	1	0.8
070 GENERAL REQUIREMENTS FOR DESIGN & CONSTRUCTION	2	1.5
073 NOISE AND VIBRATION	1	0.8
074 CASTING, WELDING, RIVETING (GENERAL)	21	16.2
075 THREADED FASTENERS STANDARDS	5	3.8
076 RELIABILITY AND MAINTAINABILITY	4	3.1
077 SAFETY	2	1.5
078 MATERIALS	73	56.2
079 SEAWORTHINESS	1	0.8
082 SUPPORT AND TEST EQUIPMENT	1	0.8
084 TRANSPORTATION AND HANDLING	2	1.5
085 ENGINEERING DRAWINGS	2	1.5
086 TECHNICAL MANUALS AND OTHER DATA	1	0.8
090 QUALITY ASSURANCE REQUIREMENTS	4	3.1
091 SHIP INSPECTIONS	3	2.3
TOTAL	131	100%

TABLE 8: DISTRIBUTION OF STANDARDS WITHIN SWBS GROUP 000-099, GENERAL STRUCTURE AND ADMINISTRATION.

The Hull Structure Group (100-199) includes two standards, both in the SWBS Subgroup 100, Hull Structure, General. Both standards are MIL Specs on steel structural shapes and plates for ships. See Table 9.

SWBS SUBGROUP	NUMBER OF STANDARDS	PERCENT
100 HULL STRUCTURE, GENERAL	2	100
TOTAL	2	100%

TABLE 9: DISTRIBUTION OF STANDARDS WITHIN SWBS GROUP 100-199, HULL STRUCTURE, GENERAL.

The Propulsion Plant Group (200-299) includes seven standards dealing with gears, couplings, and bearings. Two standards apply to heat exchangers, and one to insulation. The distribution is shown in Table 10.

SUBS SUBGROUP	NUMBER OF STANDARDS	PERCENT
200 PROPULSION PLANT, GENERAL	1	10.0
241 PROPULSION REDUCTION GEARS	3	30.0
243 PROPULSION SHAFTING	1	70.0
244 PROPULSION SHAFT BEARINGS	3	30.0
260 PROPULSION SUPPORT SYSTEMS (FUEL & LUBE OIL)	2	20.0
TOTAL	10	100%

TABLE 10: DISTRIBUTION OF STANDARDS WITHIN SWBS GROUP 200-299, PROPULSION PLANT.

The Electric Plant Group (300-399) includes 18 standards distributed among six subgroups as shown in Table 11. Electric Plant, General, SWBS 300, with over half of the standards, includes definitions, rating, and system requirements. Subgroup 302 includes definitions and test procedures for motors and generators.

SWBS SUBGROUP	NUMBER OF STANDARDS	PERCENT
300 ELECTRIC PLANT, GENERAL	10	55.6
302 MOTORS AND ASSOCIATED EQUIPMENT	4	22.2
303 PROTECTIVE DEVICES	1	5.6
304 ELECTRIC CABLES	1	5.6
314 POWER CONVERSION EQUIPMENT	1	5.6
324 SWITCHGEAR AND PANELS	1	5.6
TOTAL	18	100%

TABLE 11: DISTRIBUTION OF STANDARDS WITHIN SWBS GROUP 300-399, ELECTRIC PLANT.

The Command and surveillance Grow (400-499) includes only three standards as shown in Table 12. One is a MIL Spec on electromagnetic interference; one is on the design requirements for naval shipboard interior communications equipment; and the third is a NFPA standard for fire alarms.

SWBS SUBGROUP	NUMBER OF STANDARDS	PERCENT
407 ELECTROMAGNETIC INTERFERENCE REDUCTION	1	33.3
430 INTERIOR COMMUNICATIONS	1	33.3
436 ALARM, SAFETY, & WARNING SYSTEMS	1	33.3
TOTAL	3	100%

TABLE 12: DISTRIBUTION OF STANDARDS WITHIN SWBS GROUP 400-499, COMMAND AND SURVEILLANCE.

The Auxiliary Systems Group (500-599) has 15 standards distributed among eight SWBS subgroups. General piping requirements, HVAC, liquid gas cargo, and pipe insulation account for over half of the standards. The four general piping requirements are all MIL Standards for naval service, and one is even for *a* reducing valve on a submarine. The three HVAC standards include installation of the HVAC system and the recommended practice for maintaining relative humidity by means of aqueous solutions. There is a NFPA standard for dry cleaning plants in SWBS 557. Table 13 on the following page shows the distribution of these 15 standards.

The Outfit and Furnishings Group (600-699) includes 23 standards divided into nine subgroups. Five deal with the marking of equipment and cargo, two deal with rope, two with insulation, and nine are related to small tools. Table 14 on the next page shows the distribution.

	SWBS SUBGROUP	NUMBER OF STANDARDS	PERCENT
505	GENERAL PIPING REQUIREMENTS	4	26.7
507	MACHINERY & PIPING DESIGNATION & MARKING	1	6.7
508	THERMAL INSULATION FOR PIPING & MACHINERY	2	13.3
514	AIR CONDITIONING SYSTEM	3	20.0
521	FIREMAIN & FLUSHING (SEAWATER) SYSTEM	1	6.7
556	HYDRAULIC FLUID SYSTEM	1	6.7
557	LIQUID GASES, CARGO	2	13.3
584	MECHANICALLY OPERATED DOOR, GATE, RAMP, AND TURNTABLE SYSTEM	1	6.7
	TOTAL	15	100%

TABLE 13: DISTRIBUTION OF STANDARDS WITHIN SWBS GROUP 500-599, AUXILIARY SYSTEMS

	SWBS SUBGROUP	NUMBER OF STANDARDS	PERCENT
602	HULL DESIGNATING & MARKING	4	17.4
613	RIGGING AND CANVAS	2	8.7
625	AIRPORTS, FIXED PORTLIGHTS & WINDOWS	1	4.3
631	PAINTING	2	8.7
634	DECK COVERING	1	4.3
635	HULL INSULATION	2	8.7
651	COMMISSARY SPACES	2	8.7
655	LAUNDRY SPACES	3	13.0
665	WORKSHOPS, LABS, TEST AREAS	6	26.1
	TOTAL	23	100%

TABLE 14: DISTRIBUTION OF STANDARDS WITHIN SWBS GROUP 600-699, OUTFIT AND FURNISHINGS.

The Armament Group (700-799) has two standards in it. One deals with environmental criteria for air launched weapons, and the second with reliability of space and missile systems. See Table 15.

	SWBS SUBGROUP	NUMBEROF STANDARDS	PERCENT
720	MISSILES AND ROCKETS	1	50.0
729	MISSILE MONITORING, TEST, & ALIGNMENT	1	50.0
	TOTAL	2	100%

TABLE 15: DISTRIBUTION OF STANDARDS WITHIN SWBS GROUP 700-799, ARMAMENT.

The Integration/Engineering Group (800-899) deals with the cost of labor and material for engineering services associated with the design, development, production, testing and delivery of ships. Almost 99% of these standards are in Subgroup 841, Tests and Inspection, Criteria and Procedures. The actual accomplishment of the tests comes under SWBS Subgroup 986, Test and Inspection. All but five of the standards in Subgroup" 841 are ASTM tests for properties of various materials. Test specimens, samples, sizes, methods, results, etc. are all in this subgroup. Table 16 summarizes the distribution.

	SWBS SUBGROUP	NUMBER OF STANDARDS	PERCENT
811	CONFIGURATION MANAGEMENT	1	0.5
835	ENGINEERING CALCULATIONS	1	0.5
841	TEST & INSPECTION, CRITERIA, AND PROCEDURES	189	99.0
	TOTAL	191	100%

TABLE 16: DISTRIBUTION OF STANDARDS WITHIN SWBS GROUP 800-899, INTEGRATION/ENGINEERING.

2.3 ANALYSIS BY ASTM F-25 SUBCOMMITTEE

The distribution of standards in accordance with individual F-25 Subcommittees is shown in Table 17 on the next page. These assignments will be tentative until approved by the Executive Subcommittee of F-25. However, it is not anticipated that any substantial changes will be made.

Over half (58.7%)of the standards in this subtask belong under the cognizance of the Materials Subcommittee. This subcommittee received only a small portion of the Subtask I standards. The Electrical Subcommittee (10.9%), the Coatings Subcommittee (9.6%), and the General Support Requirements Subcommittee (9. 4%) have another 29% of the Subtask II standards. The Outfitting Subcommittee, which was heavily loaded from Subtask I and III, received only 5.17. of the standards from Subtask II.

2.3.1 Detailed Examination of SWBS Assignments to Each F-25 Subcommittee.

01 MATERIAL

TWO hundred and thirty-two standards are within the cognizance of this subcommittee. SWBS 841, Tests and Inspection, Criteria and Procedures, amounts to 60.8% of these. There are 138 ASTM standards and 3 FED Specs covering tests for a wide variety of materials.

SWBS 078, Materials, has 27.2% of the standards assigned to it. These standards are mostly ASTM specifications for. materials, such as ferrous and non-ferrous metals, insulation, chemicals, oils and plastics. Sixteen standards in SWBS 074, Casting, Welding, Riveting, make up 6.9% of the 01 subcommittee assignment. ASTM and MIL Specs were the sources. Table 18 on page 19 lists the SWBS code and the number of standards.

ASTM SUBCOMMITTEE		0 RGINAT AGMA	ANSI	ASTM	DOD	FED	INGG ORG/ IEEE	IZATI(MIL	NAS	NEMA	{FPA	TOTAL	PERCENT
.01	MATERIALS		3	215		4		9		1		232	58.7
.02	COATINGS			34		2		2				38	9.6
.03	OUTFITTING		4	1		9		6				20	5.1
.04	HULL STRUCTURE										1	1	0.3
.05	HVAC										2	2	0.5
.06	SHIP CONTROL & AUTOMATION											0	0.0
.07	GENERAL SUPPORT REQMNTS.		1	6	2	1		22			5	37	9.4
.08	DECK MACHINERY											0	0.0
.10	ELECTRICAL		8	17		2.	5	3		1	7	43	10.9
.11	MACHINERY	2	1					3		..		6	1.5
:12	WELDING			1				3				4	1.0
.13	PIPE SYSTEMS							7	1		2	10	2.5
.93	TERMINOLOGY							2				2	0.5
	TOThL	2	17	274	2	18	5	57	1	2	17	395	100.0%

TABLE 17: NUMBER OF STANDARDS ASSIGNED TO EACH ASTM F-25 SUBCOMMITTEE FROM EACH ORIGINATING ORGANIZATION

SWBS NUMBER	TITLE	NUMBER OF STANDARDS	PERCENT
042	GENERAL ADMINISTRATIVE REQUIREMENTS	1	0.4
074	CASTING, WELDING, RIVETING, ALLIED PROCESSES (GENERAL)	16	6.9
075	THREADED FASTENERS STANDARDS	5	2.2
078	MATERIALS	63	27.2
091	SHIP INSPECTIONS	3	1.3
100	HULL STRUCTURE, GENERAL	2	0.9
635	HULL INSULATION	1	0.4
841	TESTS AND INSPECTION, CRITERIA, AND PROCEDURES	141	60.8
	TOTAL	232	100.0%

TABLE 18: NUMBER OF STANDARDS BY SWBS SUBGROUP ASSIGNED TO THE MATERIALS SUBCOMMITTEE

02 COATINGS

This subcommittee has cognizance over 38 standards. SWBS 841, Tests and Inspection, accounts for 78.9% of this. These are ASTM specifications and ASTM tests for paint products, cladding material, and carpeting. See Table 19.

SWBS NUMBER	TITLE	NUMBER OF STANDARDS	PERCENT
078	MATERIALS	3	7.9
200	PROPULSION PLANT, GENERAL	1	2.6
508	THERMAL INSULATION FOR PIPING AND MACHINERY	?	2.6
631	PAINTING	2	5.3
635	HULL INSULATION	1	2.6
841	TESTS AND INSPECTION, CRITERIA, AND PROCEDURES	30	78.9
	TOTAL	38	100.0%

TABLE 19: NUMBER OF STANDARDS BY SWBS SUBGROUP ASSIGNED TO THE COATINGS SUBCOMMITTEE

03 OUTFITTING

ANSI standards and FED Specs on work shop tools account for 25% of these standards (SWBS 665). There are MIL Standards on sanitation, FED Specs on ropes, and FED Specs on general purpose ball bearings in this group. See Table 20 for a tabulation of all the SWBS subgroups involved.

SWBS NUMBER	TITLE	NUMBER OF STANDARDS	PERCENT
070	GENERAL REQUIREMENTS FOR DESIGN AND CONSTRUCTION	1	5.0
244	PROPULSION SHAFT BEARINGS	3	15.0
602	HULL DESIGNATING AND MARKING	2	10.0
'613	RIGGING AND CANVAS	2	10.0
625	AIRPORTS, FIXED PORTLIGHTS, AND WINDOWS	1	5.0
634	DECK COVERING	1	5.0
651	COMMISSARY SPACES	2	10.0
655	LAUNDRY SPACES	3	15.0
665	WORKSHOPS, LABS, TEST AREAS (INCLUDING PORTABLE TOOLS, EQUIPMENT)	5	25.0
	TOTAL	20	100.O%

TABLE 20: NUMBER OF STANDARDS BY SWBS SUBGROUP ASSIGNED TO THE OUTFITTING SUBCOMMITTEE

04 HULL STRUCTURE

The only standard involved here is an NFPA standard on fire doors.

SWBS NUMBER	TITLE	NUMBER OF STANDARDS	PERCENT
584	MECHANICALLY OPERATED DOOR, GATE, RAMP, TURNTABLE SYSTEM	1	100.0
	TOTAL	1	100.0%

TABLE 21: NUMBER OF STANDARDS BY SWBS SUBGROUP ASSIGNED TO THE HULL STRUCTURE SUBCOMMITTEE

05 HVAC

Only two standards are assigned to the HVAC Subcommittee. Both were written by NFPA and apply to the installation of air conditioning, heating and ventilating systems (SWBS 514).

SWBS NUMBER	TITLE	NUMBER OF STANDARDS	PERCENT
514	AIR CONDITIONING SYSTEM	2	100.0
	TOTALS	2	100.0%

TABLE 22: NUMBER OF STANDARDS BY SWBS SUBGROUP ASSIGNED TO THE HVAC SUBCOMMITTEE

06 SHIP CONTROL AND AUTOMATION

No standards are assigned to this subcommittee in Subtask II.

07 GENERAL REQUIREMENTS AND SUPPORT OPERATIONS

Thirty-seven standards distributed over 19 SWBS breakdowns are assigned to this subcommittee. General Administrative Requirements (SWBS 042) has six standards, including DOD and MIL drawing standards, and a FED Spec on stitching. Of the 37 standards, ASTM contributed six, and MIL 22. Table 23 on page 22 shows *all* the SWBS numbers and the standards involved.

08 DECK MACHINERY

There are no standards assigned to the Subcommittee on Deck Machinery under Subtask 11.

10 ELECTRICAL AND ELECTRONICS

This subcommittee is given cognizance over 43 standards encompassing 14 SWBS Subgroups. SWBS 84, Test and Inspection, provided 32.6% of the standards. SWBS 300, Electric Plant, General, with 10 standards added 23.3% more. There are 8 ANSI, 17 ASTM, 2 FED, 5 IEEE, 3 MIL, 1 NEMA, and 7 NFPA standards involved. See Table 24 on page 23 for the SWBS code distribution.

SWBS NUMBER	TITLE	NUMBER OF STANDARDS	PERCENT
042	GENERAL ADMINISTRATIVE REQUIREMENTS	6	16.2
060	SUBSYSTEM CHARACTERISTICS	1	2.7
070	GENERAL REQUIREMENTS FOR DESIGN AND CONSTRUCTION	1	2.7
074	CASTING, WELDING, RIVETING, ALLIED PROCESSES (GENERAL)	1	2.7
076	RELIABILITY AND MAINTAINABILITY	3	8.1
077	SAFETY	1	2.7
078	MATERIALS	2	5.4
082	SUPPORT AND TEST EQUIPMENT	1	2.7
084	TRANSPORTATION AND HANDLING	2	5.4
085	ENGINEERING DRAWINGS	2	5.4
086	TECHNICAL MANUALS AND OTHER DATA	1	2.7
090	QUALITY ASSURANCE REQUIREMENTS	4	10.8
514	AIR CONDITIONING SYSTEM	1	2.7
557	LIQUID GASES, CARGO	1	2.7
602	HULL DESIGNATING AND MARKING	2	5.4
720	MISSILES AND ROCKETS	1	2.7
729	MISSILE MONITORING, TEST AND ALIGNMENT	1	2.7
835	ENGINEERING CALCULATIONS	1	2.7
841	TEST AND INSPECTION, CRITERIA, AND PROCEDURES	4	10.8
	TOTAL	37	100.0%

TABLE 23: NUMBER OF STANDARDS BY SWBS SUBGROUP ASSIGNED TO THE GENERAL REQUIREMENTS AND SUPPORT OPERATIONS SUBCOMMITTEE

SWBS NUMBER	TITLE	NUMBER OF STANDARDS	PERCENT
042	GENERAL ADMINISTRATIVE REQUIREMENTS	1	2.3
077	SAFETY	1	2.3
078	MATERIALS	5	11.6
300	ELECTRIC PLANT, GENERAL	10	23.3
302	MOTORS AND ASSOCIATED EQUIPMENT	4	9.3
303	PROTECTIVE DEVICES	1	2.3
304	ELECTRIC CABLES	1	2.3
314	POWER CONVERSION EQUIPMENT	1	2.3
324	SWITCHGEAR AND PANELS	1	2.3
407	ELECTROMAGNETIC INTERFERENCE REDUCTION	1	2.3
430	INTERIOR COMMUNICATIONS	1	2.3
436	ALARM, SAFETY, AND WARNING SYSTEMS	1	2.3
665	WORKSHOPS, LABS, TEST AREAS (INCLUDING PORTABLE TOOLS, EQUIPMENT)	1	2.3
841	TEST AND INSPECTION, CRITERIA, AND PROCEDURES	14	32.6
	TOTAL	43	100.0%

TABEL 24: NUMBER OF STANDARDS BY SWBS SUBGROUP ASSIGNED TO THE ELECTRICAL AND ELECTRONICS SUBCOMMITTEE

11 MACHINERY

Six machinery standards deal with gears, couplings and with corrosion-preventing anodes. The SWBS number distribution is in Table 25. The standards were written by AGMS, ANSI, and MIL.

SWBS NUMBER	TITLE	NUMBER OF STANDARDS	PERCENT
079	SEAWORTHINESS	1	16.7
241	PROPULSION REDUCTION GEARS	3	50.0
243	PROPULSION SHAFTING	1	16.7
260	PROPULSION SUPPORT SYSTEMS (FUEL AND LUBE OIL)	1	16.7
	TOTAL	6	100.0%

TABLE 25: NUMBER OF STANDARDS BY SWBS SUBGROUP ASSIGNED TO THE MACHINERY SUBCOMMITTEE

12 WELDING

The four standards dealing with welding specify qualifications for personnel, electrodes, joint design and low alloy weldment steel. This subcommittee will have to coordinate closely with the Subcommittee on Materials. Table 26 follows.

SWBS NUMBER	TITLE	NUMBER OF STANDARDS	PERCENT
074	CASTING, WELDING, RIVETING, ALLIED PROCESS (GENERAL)	4	100.0
	TOTAL	4	100.0%

TABLE 26: NUMBER OF STANDARDS BY SWBS SUBGROUP ASSIGNED TO THE WELDING SUBCOMMITTEE

13 PIPING SYSTEMS

Three of the standards assigned to this subcommittee deal with naval vessels and may or may not be in the best interests of the commercial yards. The other standards in this group deal with heat exchangers, insulation, marking, valves, hydraulic cleanliness, storage of LPG, and centrifugal fire pumps. The SWBS subgroups involved are shown in Table 27. Most of the standards are from MIL.

SWBS NUMBER	TITLE	NUMBER OF STANDARDS	PERCENT
260	PROPULSION SUPPORT SYSTEMS (FUEL AND LUBE OIL)	1	10.0
505	GENERAL PIPING REQUIREMENTS	4 .	40.0
507	MACHINERY AND PIPING DESIGNATION AND MARKING	1	10.0
508	THERMAL INSULATION FOR PIPING AND MACHINERY	1	10.0
521	FIREMAIN AND FLUSHING (SEAWATER) SYSTEM	1	10.0
556	HYDRAULIC FLUID SYSTEM	1	10.0
557	LIQUID GASES, CARGO	1	10.0
	TOTAL	10	100.0%

TABLE 27: NUMBER OF STANDARDS BY SWBS SUBGROUP ASSIGNED TO THE PIPING SYSTEMS SUBCOMMITTEE

93 TERMINOLOGY

The Subcommittee on Terminology has cognizance over two MIL Standards; one dealing with definitions of terms for reliability, maintainability, human factors and safety, and the other with aperture card format.

SWBS NUMBER	TITLE	NUMBER OF STANDARDS	PERCENT
076	RELIABILITY AND MAINTAINABILITY	1	50.0
811	CONFIGURATION MANAGEMENT	1	50.0
	TOTAL	2	100.0%

TABLE 28: NUMBER OF STANDARDS BY SWBS SUBGROUP ASSIGNED TO THE TERMINOLOGY SUBCOMMITTEE

3.1 SUMMARY OBSERVATIONS

1. The industrial standards in Subtask II support shipbuilding needs adequately. This *may* not be true of the seven military standards which are included.

2. The industrial standards base is not as complex or intertwined as the regulatory/classification standards in Subtask I.

3. The maritime industry could easily be affected beneficially or adversely by changes made in the standards upon which shipbuilding contracts are based. Consensus industrial standards require the approval of all affected parties who care to vote. Industrial standards are more easily revised by action of the shipbuilders to adjust to changes in economics and technology. The standards in Subtask I are more apt to be revised adversely and greater effort will be required for monitoring Subtask I standards.

4. Shipbuilders should participate in the consensus approval cycle of ASTM, ANSI, IEEE, NAS, NEMA, and NFPA.

5. Shipbuilders should be alert for any changes in the DOD, FED, or MIL Standards which will affect construction costs.

SUBTASK II

APPENDIX A

USER'S GUIDE TO THE NSSP CATALOG OF STANDARDS FOR SHIPBUILDING

INTRODUCTION

The National Shipbuilding Standards Program Catalogue of Standards for Subtask II contains 395 entries from regulatory and industrial sources. The standards have been sorted four ways: by organization, by Ship Work Breakdown Structure, by recommended F-25 subcommittee, and by subject. This User's Guide tells how to use the catalogue *to* find standards, and what information is provided for each standard.

THE SORT BY ORIGINATING ORGANIZATION

In the first print-out, the entries are sorted alphabetically by originating organization, and then by standard number within each organization*. The regulatory and quasi-regulatory documents are subdivided into sections, pages or paragraphs so that each distinct subject has a separate catalogue entry.

THE SORT BY SHIP WORK BREAKDOWN STRUCTURE OF THE SHIP

Each standard is listed under a group, or subgroup or element of the U.S. Navy Ship Work Breakdown Structure (SWBS). SWBS is a functional system-oriented classification system which is used to group together standards which deal with functionally related subjects. For instance, SWBS Group 500 covers auxiliary systems; Subgroup 580 covers mechanical handling systems; and Element 582 covers mooring and handling systems. Thus all

*NOTE: The commercial computer program used an alphabetical sorting through these catalogues. As a result, numbers appear in alphabetical order rather than in numerical order; that is, the first character determines order regardless of number of characters. For example, the alphabetical arrangement of 2, 11, 21 is 11, 2, 21 (compare AA, B, BA).

with capstans and mooring winches are found in Element 582. Standards for related items, such as boat handling equipment, are found in other elements. Standards which apply to more than one element are assigned to the higher level subgroup or group, as appropriate. For instance, wire rope is used in several elements of Subgroup 580 and is therefore assigned a SWBS number of 580.

For a complete description of SWBS, see Ship Work Breakdown Structure, NAVSEA 0900-LP-039-9010.

THE SORT BY F-25 SUBCOMMITTEE

To assist the Executive Subcommittee of ASTM Committee F-25 on Shipbuilding, each standard was tentatively assigned to an F-25 subcommittee, and all of the standards were then sorted by subcommittee number and by standard number within each subcommittee.

THE SORT BY SUBJECT

Each standard is classified in up to three subject categories in order to group standards which describe like materials or services, regardless of functional area. For instance, blocks appear in both SWBS 573, Cargo Handling Systems, and SWBS 580, Mechanical Handling Systems. In the catalogue by subject, all standards which have been assigned a subject category of "Block" appear together. Note that "Block" is used rather than "Block; Cargo Handling" and "Cargo Handling Block" because SWBS provides *a* means of grouping cargo handling standards; the subject categories need not do so.

KEY TO CATALOGUE ENTRIES

Figure A-1 is a page of the catalogue marked up to facilitate reference to the following descriptions of the data elements. Paragraph numbers below refer to circled numbers on Figure A-1.

CATALOG BY ORGANIZATION

(1) ORG CODE	(2) NO. OF STANDARD	(3) RV YR	(4) RF YR	(5) SWBS	(6) TYPE OF STANDARD	(7) POTENTIL BENEFITS	(8) HOD NEED	(9) SYSTM UNITS	(10) F-25 COMM	(11) SYNONYMS ORGCD	STANDARD-1	YR	(12) SYNONYMS ORGCD	STANDARD-2	YR	(13) SYNONYMS ORGCD	STANDARD-3	YR
	(14) SUBJECT CATEGORY									(A)	(B)	(C)	(A)	(B)	(C)	(A)	(B)	(C)
											(15) STANDARD TITLE							
IEC	292-1 STARTERS,MOTOR, AC STARTERS,MOTOR, LOW VOLTAGE STARTERS, ON-LINE	69	302	5	2	3	D	10			LOW-VOLTAGE MOTOR STARTERS PART 1. DIRECT-ON-LIN E (FULL VOLTAGE) A.C. STARTERS							
IEC	292-2 STARTERS, REDUCED VOLTAGE, AC STARTERS, STAR-DELTA	70	302	5	2	3	D	10			LOW-VOLTAGE MOTOR STARTERS,PART 2. REDUCED VOLTA GE A.C. STARTERS:STAR-DELTA STARTERS							
IEC	298 SWITCHGEAR,ENCLOSED,HIGH-VOLTAGE CONTROLGEAR,ENCLOSED,HIGH-VOLTAGE	69	324	5	1	3	D	10		ANS	C37.20 HIGH-VOLTAGE METAL-ENCLOSED SWITCH-GEAR AND CONT ROLGEAR	69						
IEC	332 CABLES,FLAME RETARDANT, TESTS	70	906	4	1	3	D	10			FLAME-RETARDANT CHARACTERISTICS OF ELECTRIC CABL ES							
IEC	337-1 SWITCHES,CONTROL, LOW VOLTAGE RELAYS,CONTACTOR	70	430	5	2	3	D	10			CONTROL SWITCHES (LOW-VOLTAGE SWITCHING DEVICES FOR CONTROL AND AUXILIARY CIRCUITS,INCLUDING CON TACTOR RELEYS)PART 1							
IEC	34-1 MOTORS, ELECTRIC GENERATORS	69	302	5	1	3	D	10			ROTATING ELECTRICAL MACHINES, PART 1.RATING AND PERFORMANCE							
IEC	34-5 ENCLOSURES, MOTOR ENCLOSURES, GENERATOR	68	302	5	2	3	D	10			ROTATING ELECTRICAL MACHINES,PART 5. DEGREES OF PROTECTION BY ENCLOSURES FOR ROTATING MACHINERY							
IEC	344 CABLES,INTERIOR COMMUNICATIONS CABLES,LOW FREQUENCY RESISTANCE,WIRE,CALCULATION OF	71	304	2	1	3	D	10			GUIDE TO THE CALCULATION OF RESISTANCE OF PLAIN AND TINNED COPPER CONDUCTORS OF LOW-FREQUENCY CA BLES AND WIRES							
IEC	38 VOLTAGES STANDARD,50 HZ VOLTAGES,STANDARD,60 HZ	75	75	300	1	1	3	D	10	ANS	C84.1 IEC STANDARD VOLTAGES	70						
IEC	4166 ENCLOSURES INSULATED HIGH- VOLTAGE	74	324	5	0	3	P	10			HIGH-VOLTAGE INSULATION-ENCLOSED SWITCHGEAR AN D CONTROLGEAR							
IEC	447 ACTUATORS,STANDARD DIRECTION OF MOVEMENT	74	042	1	1	3	D	10			STANDARD DIRECTIONS OF MOVEMENT FORACTUATORS WHI CH CONTROL THE OPERAT-ION OF ELECTRICAL APPARATU S							
IEC	50(05) DEFINITIONS,ELECTROTECHNICAL	56	042	1	1	3	D	99			INTERNATIONAL ELECTROTECHNICAL VOCABULARY.FU NDAMENTAL DEFINITIONS							

FIGURE A-1: DATA ELEMENTS OF CATALOG ENTRIES, AS DESCRIBED IN THE TEXT.

1: Organization Code

This is an up-to-five character code for an originating organization. The following organization codes appear in the catalogue:

DOMESTIC ORGANIZATIONS

ABS	American Bureau of Shipping Rules for Building and Classing Steel Vessels
ABS 01	Nondestructive Inspection of Hull Welds
ABS 02	Approved Welding Electrodes Wire-Flux and Wire-Gas Combinations
ABS 03	Offshore Mobile Drilling Units
ABS 04	Steel Barges for Offshore Service
ABS 05	Bulk Carriers for Service on the Great Lakes
ABS 06	River Rules '71
ABS 07	Inert Gas Installations on Vessels Carrying Oil in Bulk
ABS 08	Certification of Cargo Containers
ABS 09	Manual for Making Bronze Propeller Repairs
ABS 10	Repair, Welding, Cladding and Straightening of Tail
ABS 11	Burning Crude Oil and Slops in Main and Auxiliary Boilers
ABS 12	Steel Floating Dry Docks
ABS 13	Underwater Inspection in Lieu of Dry Docking Survey
ABS 14	Construction of Shipboard Elevators
ABS 15	Certification of Construction and Survey of Cargo Gear on Merchant Vessels
ABS 16	Certification of Self-unloading Cargo Gear on Great Lakes Vessels
ABS 17	Single Point Moorings

ABS 18	Aluminum Vessels
ABS 19	Classification of Nucelar Ships
ABS 20	Submersible Vessels
ABYC	American Boat and Yacht Council, Incorporated
AMCA	Air Moving and Conditioning Association, Inc.
ANSI	American National Standards Instutite
ASTM	American Society for Testing and Materials
DOL	Department of Labor
EPA	Environmental Protection Agency
FCI	Fluid Controls Institute, Incorporated
FED	Federal Specification
HEI	Heat Exchange Institute
HI	Hydraulic Institute
IEEE	Institute of Electrical and Electronics Engineers, Inc.
IES	Illuminating Engineering Society
IMCO	Intergovernmental Maritime Consultive Organization
IPCEA	Insulated Power Cable Engineers Association
JIC	Joint Industrial Council
MARAD	Maritime Administration
MASS	MARAD Standard Specification
MASSD	MARAD Standard Specification - Diesel
MIL	Military Specification
MSS	Manufacturers Standardization
NBS	National Bureau of Standards
NEMA	National Electrical Manufacturers Association
NFPA	National Fire Protection Association

OCMIF	Oil Companies International Marine Forum
PCC	Panama Canal Company
SCA	Suez Canal Authority
SNAME	Society of Naval Architects and Marine Engineers
SOLAS	Safety of Life at Sea, International Convention of
SSPC	Steel Structures Painting Council
TEMA	Tubular Exchanger Manufacturing Association
UL	Underwriters Laboratories, Incorporated
USCG	United States Coast Guard
USDA	United States Department of Agriculture
USN	United States Navy

FOREIGN STANDARDS

BV	Bremer Vulkan Schiffbau und Maschinen Fabrik (German Shipbuilder)
DIN	Deutsches Institute fur Normung (German Standards Institute)
HDW	Fachnormenausschuss Schiffbau (A committee of DNA, a shipbuilders' association)
HMN	Hivirich Mohr Elmsworn (deck hardware vendor)
IEC	International Electrotechnial Commission
IS0	International Standards Organization
JIS	Japanese Standards Association (JIS Standards for Japanese Industrial Standard)
RNS	Rheinstahl Nordseewerke Gmb. H.Emden (deck hardware vendor)
WWN	Wernormer (abbreviation used in purchase orders to describe product standard)

2. Number of Standard

A typical entry shows the standard number assigned by the issuing organization. For example, IEC 296 is standard 296 for High Voltage Switch-gear issued by the International Electrotechnical Commission. If the standard or specification has been published with more than one part, as was IEC 292, then there will be two entries, IEC 292-1 and IEC 292-2, *one* for each part.

In cases where *a* code or specification is published, such *as* the ABS Rules for Building and Classing Steel Vessels covering many standards, or *norms,* the document is indexed by section and subsection. Thus ABS 30.1 means ABS Rules Section 30 Subsection 1.

3. Year of Revision

This is the date issue or revision of the standard by its originating organization.

4. Year of Reaffirmation

Standards are often reaffirmed without revision. The most current date of reaffirmation is shown. If the most recent action was revision rather than reaffirmation, no reaffirmation date appears.

5. Ship Work Breadkown Structure Code (SWBS)

SWBS is a classification system developed by the U.S. Navy. *The* functional segments of a ship are classified using a set of groups, subgroups, and elements which are assigned three digit codes. For a full description of the SWBS, see Ship Work Breakdown Structure, NAVSEA O9OO-LP-O39-9O1O. The major SWBS groups are:

000 - General Guidance and Administration
100 - Hull Structure

200 - Propulsion Plant
300 - Electric Plant
400 - Command and Surveillance
500 - Auxiliary Systems
600 - Outfit and Furnishings
700 - Armament
800 - Integration/Engineering
900 - Ship Assembly and Support Services

The numbers of the groups, subgroups and elements are incorporated at the end of this appendix, see pages A-11 through A-23 following. In addition, items of load, such as stores, are assigned SWBS codes beginning with "F", such as F40 Fuels and Lubricants.

6. Types of Standards

This is a one digit code to show the primary thrust of the standards. The codes are:

1 - The standard establishes definitions or classification.
2 - The standard is used primarily in design activities.
3 - The standard is used primarily in production operations.
4 - The standard is used primarily in test and/or inspection activities.
5 - The standard defines, limits, or boundaries (specifications) on the characteristics of materials, items, systems, or services.

7. Potential Benefits

This is a one digit code representing a rough assessment of the potential industry-wide benefits of the standard, on a scale of 0 meaning none, to 3 indicating great benefit.

8. Modification Required for Shipbuilding Use

This is a one digit code representing an assessment of the standard's readiness for domestic shipbuilding use, on a

scale of 1 to show that major modifications are required, to 3 indicating immediate usefulness.

9. System of Units

The systems of units used in the standard is codes as follows:

M - Metric System or Internation System (S.I.)
E - U.S. Customary System or British Imperial System
D - Dual: Metric/U.S. Customary or British Imperial
N - Not Applicable
O - Other Unique System
U - Unknown

10. F-25 Subcommittees

This is the recommended preliminary assignment of the standard to an F-25 subcommittee, according to the F-25 subcommittee number designations:

01 - Materials
02 - Coatings
03 - Outfitting
04 - Hull Structure
05 - Heating, Ventilation, and Air Conditioning
06 - Ship Control and Automation
07 - General Requirements*
08 - Deck Machinery
09 - Shipbuilding Support Operations
10 - Electrical and Electronics
11 - Machinery
12 - Welding
13 - Piping Systems
91 - Long-Range Planning
92 - Editorial
93 - Terminology

* NOTE that Subcommittees 07 and 09 have recently been merged into 07, General Support Requirements. Later editions will reflect this change.

11, 12, and 13. Synonymous Standard Numbers

Often a standard is issued by more than one organization, each of whom assigns a different number to the standard. Synonymous numbers arise when two or more organizations collaborate on the standard and each issues it, and when a national or international organization approves and issues a standard prepared by a lower-level organization. Up to three synonyms may appear in the report.

llA, 12A, and 13A. Synonymous Issuing Organization

These are the codes for organizations other than the originator which issued the standard.

llB, 12B, and 13B. Synonymous Standard Number

These are the numbers assigned to the standard by the synonymous issuing organizations.

1lC, 12C, and 13C. Synonymous Standard Date

This is the date of latest issue or reaffirmation of the standard by the synonymous organization.

14. Subject Category

Each standard has been assigned to one, two, or three subject categories for the purpose of preparing the subject category catalogue.

15. Title

The full title of the standard appears here.